User Manual

Antenna signal meter system

MSK 200

MSK 200/50

KATHREIN

Antennen · Electronic

PREFACE/IMPORTANT NOTES

Dear customer,

We kindly ask you to observe all instructions contained in this manual. The Kathrein-Werke KG has made every effort to ensure that the data and descriptions in this manual are accurate and complete.

We reserve the right to make changes to this manual without prior notice. This particularly applies to modifications required for technical improvement.

We appreciate your recommendations and suggestions for improvement.

Publications, copies and print-outs as well as electronic distribution of this manual in full or in part is only allowed with written authorisation from the Kathrein-Werke KG.

All product names and trademarks used in this manual are the property of the relevant companies.

VALIDITY OF THIS MANUAL

This manual is valid for the antenna signal meter system MSK 200, Order No.: 21710015 and MSK 200/50, Order No.: 21710018.

The following notes are relevant for the operation of the MSK 200 and should be adhered to under all circumstances.

GENERAL SAFETY INFORMATION

The MSK 200 has been developed and produced in consideration of the relevant harmonised guidelines, standards as well as further technical specifications. The product complies with the latest technology and ensures a high degree of safety. However, this degree of safety can only be achieved during operation if all required measures have been taken by the operator.

Electronic equipment is not domestic waste - in accordance with directive 2002/96/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL dated 27th January 2003 on used electrical and electronic appliances, it must be disposed of properly.
At the end of its service life, take this unit for disposal to an appropriate official collection point.

Used batteries are hazardous waste!
Do not throw empty batteries into your domestic waste; take them to a collection point for used batteries!

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SAFETY

This device was built and tested in accordance with the enclosed EU certificate of conformity and left the factory in a condition fullfilling all requisite safety regulations. To ensure that this condition is maintained and to ensure hazard-free operation, the user must observe all instructions, warnings and warning notes.

Symbols used on Kathrein devices and in manuals:

Follow operating instructions

Information on the weight of devices with a mass > 18 kg

Earth conductor connection. Ground connection point caution!

Hazardous voltage on physical contact

Warning hot surfaces

Electrostatic sensitive components requiring special handling

Attention Earthing!

1. The device is only allowed to be operated in the operational status and in systems as stated by the manufacturer (attention is to be paid to adequate ventilation). The following applies: IP protection class 2X, degree of soiling 2, overvoltage category 2, only for use indoors, operation at up to 2000 m above sea level. Outdoor use is only permissible if the measuring instrument is protected from rain and humidity. The device is only allowed to be operated on supply grids that are protected with fuses with a maximum rating of 16 A. If not otherwise stated in the data sheet, a tolerance of ± 10 % applies to the nominal mains voltage and a tolerance of ± 5 % to the nominal mains frequency.
2. In case of measurements in circuits with voltages Ueff > 30 V, precautions must be taken using suitable measures to ensure that any hazard is excluded (e.g. suitable measuring equipment, fuse protection, current limiting, isolation, insulation, etc.).
3. If a device is installed in a fixed position, the connection between the on-site earth conductor connection and the device‘s earth conductor is to be made before any other connections are made. Installation and connection should only be performed by trained electricians.
4. If devices in a fixed installation do not have a fuse, circuit breaker or similar protective device, the supply circuit must be fused so that device and user are adequately protected.

5. Prior to switching on the device, ensure that the nominal mains voltage set on the device and the nominal mains voltage of the supply match. If it is necessary to change the voltage setting, it may also be necessary to change the respective mains fuse for the device.

6. In case of devices in protection class I with a flexible mains cable and mains plug, operation is only allowed using wall socket outlets with an earth contact and connected earth conductor.

7. Any intentional interruption of the earth conductor, either in the supply cable or in the device itself is not allowed and can result in a dangerous voltage being laid directly on the device. If extension cables or power strips are used, it is imperative that these are checked that they comply with safety regulations at regular intervals.

8. The device is not equipped with a mains switch allowing mains disconnection. Therefore, the plug on the connection cable is to be considered a mains power disconnection element. It is to be ensured the mains plug is easily accessible at all times (length of the connecting cable approx. 2 m). Function switches or electronic switches are not suitable for mains isolation. If devices without a mains switch are integrated into racks or systems, the mains power disconnection element is to be moved to system level (system level switch-off).

9. During all work, the local and national health and safety regulations are to be followed. Prior to work on the device or opening the device, it is to be isolated from the mains supply. Calibration, replacement of parts, maintenance and repair should only be undertaken by trained electricians. If safety-related parts (e.g. mains switches, mains transformers or fuses) are replaced, these must only be replaced with original parts. A safety test is to be performed after any replacement of safety-related parts (visual inspection, earth conductor test, insulation resistance, leakage current measurement, function test).

10. In case of connections to information technology devices, it is to be ensured that these devices comply with IEC950/EN60950.

11. Lithium batteries are not to be subjected to high temperatures or fire. Keep the batteries away from children. If the battery is incorrectly replaced, there is a risk of explosion. Replace the batteries only with the original type (see list of spare parts). Lithium batteries are hazardous waste. Only dispose of them in containers provided for this purpose. Do not short-circuit batteries.

12. Devices that are returned or sent in for repair must be packed in the original packaging or in packaging that provides protection against electrostatic charging and discharging as well as against mechanical damage.

13. Discharges via connectors can damage the device. The device is to be protected against electrostatic discharge in use and operation.

14. Clean the exterior of the device with a soft, fluff-free duster. Under no circumstances use solvents such as thinners, acetone or similar, as otherwise the front panel markings or plastic parts may be damaged.

15. Additional safety instructions in this manual are also to be followed.

FEATURES/DELIVERY SCOPE

The MSK 200 is a compact state-of-the-art signal meter which leaves nothing to be desired when you are checking antenna and cable systems or even professional head-end systems. It can be used either in a lab or for the monitoring of remote-controlled head-end systems, or for final measurements on antenna and distribution systems.

DELIVERY SCOPE

MSK 200:

- 1 antenna signal meter system MSK 200
- 1 AC power supply unit
- Transport case
- 1 measurement cable - BNC plug - BNC socket
- 1 adaptor - 1.6/5.6 plug - BNC socket
- 1 adaptor - BNC socket - F socket
- 1 adaptor - BNC socket - F connector
- 1 adaptor - BNC socket - IEC socket
- 1 adaptor - BNC socket - IEC plug
- 1 shoulder strap
- 1 fuse T 8.0 A

MSK 200/50:

- 1 antenna signal meter system MSK 200/50
- 1 AC power supply unit
- Transport case
- 1 shoulder strap
- 1 fuse T 8.0 A

OPERATION

INITIAL START-UP

Prior to operating for the first time, please take the T 8.0 A fuse out of the packaging and fit it into the provided fuse holder.

After insertion of the protector, the device muss be operated or charged on the power supply unit for approximately two hours. Subsequently, the device must be completely discharged during battery-powered operation (until the device switches off by itself). Battery charge level can only be correctly displayed if the device has been fully charged and then fully discharged.

The fuse prevents the device being switched on unintentionally during transport.

Caution!
Please remove this fuse again before shipping the device!

Remove the AC power supply unit (100V ... 250V) supplied from the packaging and connect the device to the mains using the power supply. The Li ion rechargeable battery in the device will now be charged. The green light emitting diode indicates use of an external power source. You can check the charge state of the rechargeable battery by pressing the “Test“ key.

Caution!

See also “Charging indicator” and “DC supply socket” in the section “Interfaces”

SETTING UP THE DEVICE

When setting up the device pay attention to adequate ventilation!

To avoid a build-up of heat, the openings for the fan and the ventilation holes must always be kept clear. Set up the device as shown in the figure.

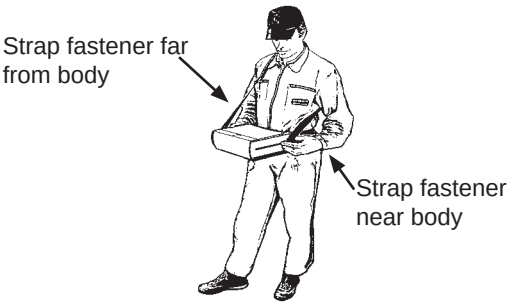
SET-UP OPTIONS

OPERATION

USING THE DEVICE ON THE SHOULDER STRAP

When the device is used on the strap, also provide for adequate ventilation!

To avoid a build up of heat, the openings for the fan and the ventilation holes must always be clear.

For right-handed users Pass the shoulder strap over your right shoulder!	**For left-handed users** Pass the shoulder strap over your left shoulder!
	

Warning!
To avoid neck injuries, do not just hang the measuring instrument around your neck, but observe the instructions above.

You can move the softkeys from right to left by activating the following sequence of keys “EXTEND“, “SETUP“, “LOOK´N FEEL”, “BAR LAYOUT”!

GENERAL OPERATION

KEYBOARD OPERATION

EXTEND	SETTINGS: SAVE, SETUP, COPY, PRINT
ON/OFF	Switching the device ON/OFF, or to standby mode. If the button is kept pressed more than 5 seconds, the device is switched off.
DISPLAY	Switching the SOFTKEYS ON/OFF, zooming in the graphic display
SOURCE	SELECTING SOURCES: SAT analogue, SAT digital, CATV analogue, CATV digital, TV analogue, TV digital, FM radio, AV menu
COPY	SAVING and PRINTING data: Saving and triggering device settings
ANALYSE	SELECTING SIGNAL METER: spectrum analyser, oscilloscope, constellation analyser, entire measurement, Auto-Messung, DiSEqC™, UFO®*micro*-DiSEqC™, MPEG data, picture representation
VOL.+	Increasing the VOLUME
VOL.-	Reducing the VOLUME
CHAN +	PROGRAMME STEPPING +
CHAN -	PROGRAMME STEPPING -
FUNCTION	SECOND FUNCTION of touchscreen
HELP	HELP

TOUCHSCREEN OPERATION

Tap on the touchscreen keys to select the respective task!

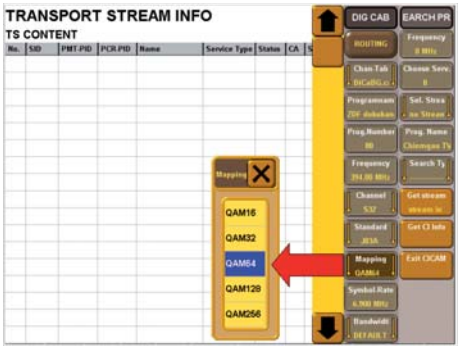
This type of key opens a further menu!

When the “SOURCE“ button is pressed, the source selection buttons appear, which can be used to select the signal path!

When the “ANALYZE” key is pressed, the measurement selection buttons appear, which can be used to select the desired measurement or measurement process!

SOURCES Selection (SOURCE)

Measurement Selection (ANALYZE)



This type of key leads to a selection of various settings (such as selection of the type of demodulation)!

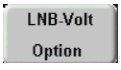
This type of key offers the facility for alphanumerical input (e.g.: entering programme names)!

This type of key offers the facility for numerical input (e.g.: entering programme numbers)

Tap on the screen to set the markers directly or to shift them!

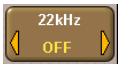
To open the zoom window, press and hold your finger on the marker; you can then shift it to the desired position!

Press the “FUNCTION“ key, tap on the screen and hold to drag the screen section as required (e.g.: the delay time on the oscilloscope, the mid-frequency on the spectrum analyser)!



This type of key indicates an option that is unavailable on this unit!

This type of key indicates a defective function in the unit!



Tap on this type of key to switch between two operating modes (e.g.: 22 kHz signal ON/ OFF)!

Press this key e.g. to print the screen display!

OPERATION

THE HELP FUNCTION

The MSK 200's help function follows a new concept. All help files have been saved in the MSK 200 and can be called up whenever required. All you have to do to call up the help menu is to press
HELP

CHANGE THE HELP MENU'S DISPLAY LANGUAGE

In order to change the help menu's display language, please carry out the following steps:

EXTEND → "**SETUP**" → "**HELP LANG**" → choose the required language from the displayed list

Attention:

Proceed as follows to receive help on signal source and measurement parameters:

HELP → INHALT *(content)* → "**Operation**"

CHOICE OF THE SIGNAL SOURCE AND MEASUREMENT

The most important keys on the MSK 200 are SOURCE and ANALYSE .
After activating the SOURCE key, you will be able to define the source and the channel or transponder to be measured. After pressing the ANALYSE key, you will be able to choose the type of measurement wanted and have this carried out. In the MSK 200's display, the ANALYSE menu is always positioned at the edge of the display with the SOURCE menu positioned next to it. Both menus should be seen as being completely independant of each other, and be independantly operated.

CHOICE OF THE SIGNAL SOURCE

By pressing the hard key SOURCE you will be able to choose a signal source from the list displayed.
The following sources can be chosen:

DIG CABL	Digital Cable TV
DIG SAT	Digital Satellite TV
DIG TERR	Digital Terrestrial TV
ANA CABL	Analogue Cable TV
ANA SAT	Analogue Satellite TV
ANA TERR	Analogue Terrestrial TV
FM-RADIO	Analogue Radio (FM / UKW)
AV/TS INP	Audio/Video or Transport stream Input

Note: Not all signal sources can be called up directly during a measurement operation. Due to this, we recommend that you call up the spectrum analyser before changing the signal source (see point 4, Measurement choice)
Provided you have already chosen a signal source, the corresponding Help file will be opened once the HELP key has been pressed.

OPERATION

CHOOSING THE CHANNEL TO BE MEASURED

Now one can choose the channel to be measured:

Generally there are different possibilities offered as to how a measurement channel can be chosen

1. Selection of programme through programme name
1.1. Press “Chan.Tab“ to select the desired channel table
1.2. Enter the desired programme name in the entry field “Prog.Name“ (the programme name is automatically completed)
2. Selection of programme through channel number
2.1. Press “Chan.Tab“ to select the desired channel table
2.2. Use “Prog.Number“ to enter the desired programme position
3. Selection of programme through channel
3.1. Press “Chan.Tab“ to select the desired channel table
3.2. The desired channel can be selected in the “Channel“ menu
4. Selection of programme through frequency
4.1. Press “Chan.Tab“ to select the desired channel table
4.2. The desired frequency can be set in the entry field “Frequency“
4.3 The frequency entered is automatically corrected to the appropriate video carrier frequency or channel centre frequency. Use the “<“ and “>“ keys to fine-tune the frequency

If “Couple Chan“ is set to “TO STAND“ in the “PREFERENCES“ menu, all other parameters (Standard, Mapping, Symbol Rate etc.) are automatically set. To set the parameters individually, go to the “PREFERENCES“ menu and change the setting “Couple Chan“ to “NOT COUP.“

SELECTING THE DESIRED MEASUREMENT

In order to carry out a measurement after one has successfully selected the desired channel, one now has to select the required measurement instrument using the hard-key ANALYSE - the measurement instrument being selected from the list in the displayed on-screen menu.

The following measurements or measurement instruments can be selected:

MORE...	Submenu for settings (preferences), channel list editing, DiSEqC and auto-measurement functions
SPECTRUM	Spectrum analyser
CONST.	Constellation analyser
IMPULS	Impulse / Reflection measurement (exclusively for DVB-T)
SIDATA	Read in MPEG stream, MPEG monitor
SCOPE	Memory oscilloscope
SUMMARY	Summary measurements, simultaneous measurement of RF signal level, S/N, MER, BER, HUM and video voltage
TV-PICT.	Display of video, video text display
AV/TS OUT	Settings for diverse outputs (ASI, TS parallel, Video)

Information on the individual measurement possibilities can also be found in the on-board help menus. Generally an optimal pre-setting of parameters is saved in the MSK 200 for each type of measurement. There are though many other set-up possibilities that can be carried out dependant on the measurement in question. These can be viewed in the specific menu.
In some measurement processes further set-up possibilities can be called up:

- **SPECTRUM**
- **CONST.**
- **SCOPE**
- **MARKER** or **SETTING**
- **IMPULS** or **CARRIER SEL** (only for “DIG TER.“)
- **TRIGGER** or **MORE**

FUNCTION OVERVIEW

OPERATION

Mains	external AC power supply unit	100...240 V
Battery	internal Li-Ion battery	12 V/6,5 AH
external battery supply	vehicle	11 V...16 VDC

OPERATION

keyboard	12 hardkeys	On/Off, Help, Prog.+, Prog.-, Analyze, Source, OSD/Off, Vol.+, Vol.-, Copy, Function, Extend
external keyboard	ASCII keyboard (PS2)	to enter ASCII characters
Touch	Infra-red Touch	Intuitive operation and ASCI character entry

REMOTE CONTROL

Ethernet				
RS232				
PCMCIA-Module	analogue modem	GSM modem		

VIDEO DISPLAY

Analogue video	TV-CATV	TV terrestrial	Satellite	SCART/video
FTA digital video	DVB-C J83 B	DVB-T ATSC	DVB-S	TS-parallel/ASI
Scrambled digital video	DVB-C J83 B CI/CA	DVB-T ATSC CI/CA	DVB-S CI/CA	TS-parallel/ASI CI/CA

SIGNALLING

Display	Position	green signal	red signal
operational mode/ standby	Front (using ON/OFF button)	In mains or external DC operation	Battery operation
LNB supply	Front (using EXTEND button)	Voltage supply is on, blinks if overloading is greater than 0.6 A	external voltage is connected

Note:

Switch to “standby” by pressing ON/OFF and then selecting the “suspend Mode”, or by closing the display cover!

Display	Position	green signal	yellow signals
Battery status	rear panel	green = charging	5 x each 20 % = Battery status

FUNCTION OVERVIEW

RECEPTION RANGES

TV (CATV/terrestrial)	5...900 MHz
Satellite	900....3100 MHz
FM	87,5...108 MHz
Spectrum analysis	5...3100 MHz

DEMODULATION

Digital CATV	J83 A/C (DVB-C) 16, 32, 64, 128 ,256 QAM	J83 B 64 QAM	DOCSIS 64, 256 QAM
Analogue CATV	PAL, NICAM B/G, I, D/K, L/L´, M/N	NTSC, NICAM B/G, I, D/K, L/L´, M/N	SECAM, NICAM B/G, I, D/K, L/L´, M/N
Digital-terrestrial	COFDM (DVB-T) 2k, 8k; 4, 16, 64 QAM; 6,7,8 MHz	ATSC 8 VSB	
Analogue-terrestrial	PAL, NICAM B/G, I, D/K, L/L´, M/N	NTSC, NICAM B/G, I, D/K, L/L´, M/N	SECAM, NICAM B/G, I, D/K, L/L´, M/N
Digital-satellite	DVB-S QPSK		
Analogue-satellite	PAL B/G, I, D/K, L/L´, M/N	NTSC B/G, I, D/K, L/L´, M/N	SECAM B/G, I, D/K, L/L´, M/N
Radio	FM		

MEASUREMENT OPTIONS

Spectrum analyser	Level measurement, Video/audio carrier, Levels of digital signals, C / N	Frequency measurement, Frequency spacing	CTB, CSO
Constellation analyser	Constellation, 4,16,32,64,128,256QAM, COFDM	MER, BER, Frequency offset	Echo display (DVB-T)
NICAM-BER	BER measurement in analogue TV modulation		
Memory oscilloscope	Audio, Amplitude, Daviation, Frequency	Video, Line memory, Amplitude, S/N weighted, S/N unweighted	DiSEqC™, Swing in/out, 22 kHz carrier, modulation
MPEG screen	SID, PMT, PCR, Channel name, type of service, programme status, CA information, elementary current, video/audio, NIT		
DiSEqC screen	DiSEqC™2.0 transmitter and receiver	UFO®*micro* DiSEqC™	
LNB multimeter	current 0...30 V DC	current 0...600 mA DC	Remote feed currrent and voltage

SAVING MEASURED VALUES

Internal memory	Data logging
Printer	

INTERFACES

MSK 200/50 with 50 Ohms N-type socket

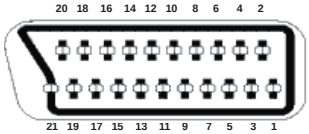
USB PORTS

Connection	Signal
1	VCC (+ 5 V)
2	- Data
3	+ Data
4	Earth

VIDEO OUTPUT (BNC)

- Video OUT
- 75 Ohm
- 1 Vpp

SCART PIN ALLOCATION



Pin	Signal	Designation
1	Audio output right	
2	Audio input right	
3	Audio output left	
4	Audio Earth	
5	Blue Earth	
6	Audio input left	
7	Blue Signal	
8	Switching voltage	U_SCART
9	Green Earth	
10	Data line	not assigned
11	Green signal	
12	Data signal	not assigned
13	Red Earth	
14	Data Earth	not assigned
15	Red Signal	
16	Blanking Signal	Fast Blank
17	Video Earth	
18	Blanking Signal Earth	
19	Video output	Baseband output if decoder is operated
20	Video input	Baseband input if decoder is operated
21	Shielding	

INTERFACES

HEADPHONE OUTPUT

Connection	Signal
1	Audio left
2	Audio right
3	Earth

VIDEO INPUT (BNC)

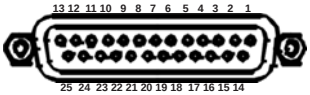
- Video IN
- 75 Ohm
- 1 Vpp

PCMCIA INTERFACE

Pin	Signal	Designation
1	GND	Earth
2	D3	Data bus
3	D4	Data bus
4	D5	Data bus
5	D6	Data bus
6	D7	Data bus
7	CE1	Card Enable 1, Control signal
8	A10	Address bus
9	OE	Output Enable, Control signal
10	A11	Address bus
11	A9	Address bus
12	A8	Address bus
13	A13	Address bus
14	A14	Address bus
15	WE_PGM	Write Enable, Control signal
16	IOREQ	Control signal
17	VCC2	Supply +5V
18	VPP1	Programming voltage 1
19	A16	Address bus
20	A15	Address bus
21	A12	Address bus
22	A7	Address bus
23	A6	Address bus
24	A5	Address bus
25	A4	Address bus
26	A3	Address bus
27	A2	Address bus
28	A1	Address bus
29	A0	Address bus
30	D0	Data bus
31	D1	Data bus
32	D2	Data bus
33	WP/OIS16	Write Protect, Control signal
34	GND	Earth

Pin	Signal	Designation
35	GND	Earth
36	CD1	Card Detect, Control signal
37	D11	Data bus
38	D12	Data bus
39	D13	Data bus
40	D14	Data bus
41	D15	Data bus
42	CE2	Card Enable 2, Control signal
43	VS1	Refresh, Control signal
44	IORD	IO Read, Control signal
45	IOWR	IO Read, Control signal
46	A17	Address bus
47	A18	Address bus
48	A19	Address bus
49	A20	Address bus
50	A21	Address bus
51	VCC1	Supply voltage +5V
52	VPP2	Programming voltage 2
53	A22	Address bus
54	A23	Address bus
55	A24	Address bus
56	A25	Address bus
57	VS2	RFU, Control signal
58	Reset	Control signal
59	Wait	Control signal
60	INPACK	Control signal
61	REG	Register Select, Control signal
62	BVD2, SPKR	Battery Voltage Detect 2
63	BVD1	Battery Voltage Detect 1
64	D8	Data bus
65	D9	Data bus
66	D10	Data bus
67	CD2	Card Detect 2, Control signal
68	GND	Earth

TS PARALLEL INPUT/OUTPUT PIN ASSIGNMENT (SUB-D 25, LVDS)



Pin	Signal	Designation
1	CLOCK A	Data word clock
2	GND	Earth
3	DATA BIT 7 A	Data bit 7 (MSB)
4	DATA BIT 6 A	Data bit 6
5	DATA BIT 5 A	Data bit 5
6	DATA BIT 4 A	Data bit 4
7	DATA BIT 3 A	Data bit 3
8	DATA BIT 2 A	Data bit 2
9	DATA BIT 1 A	Data bit 1
10	DATA BIT 0 A	Data bit 0 (LSB)
11	DVALID A	Data word valid
12	PSYNC A	Packet sync.
13	GND	Earth
14	CLOCK B	Data word clock inv.
15	GND	Earth
16	DATA BIT 7 B	Data bit 7 inv. (MSB)
17	DATA BIT 6 B	Data bit 6 inv.
18	DATA BIT 5 B	Data bit 5 inv.
19	DATA BIT 4 B	Data bit 4 inv.
20	DATA BIT 3 B	Data bit 3 inv.
21	DATA BIT 2 B	Data bit 2 inv.
22	DATA BIT 1 B	Data bit 1 inv.
23	DATA BIT 0 B	Data bit 0 inv. (LSB)
24	DVALID B	Data word valid/inv.
25	PSYNC B	Packet sync. inv.

INTERFACES

RF INPUT (1.6/5.6) AT 75 OHMS OR N-TYPE SOCKET AT 50 OHMS

Please note that the following parameter levels must not be connected to the RF input socket:

- no RF voltage level above 130 dBµV,
- no positive direct voltage above 60 V DC (LNB supply voltage “OFF”),
- no negative direct voltage
- no alternating voltage above 70 V AC (LNB supply voltage “off”)

If these values are exceeded, the input stages and the meter can be damaged! If externally generated voltages are connected to the meter, LNB or Control voltages must be switched off!

COMMON INTERFACE

Pin	Signal	Designation
1	GND	Earth
2	D3	Data bus
3	D4	Data bus
4	D5	Data bus
5	D6	Data bus
6	D7	Data bus
7	CE1	Card Enable 1, Control signal
8	A10	Address bus
9	OE	Output Enable, control signal
10	A11	Address bus
11	A9	Address bus
12	A8	Address bus
13	A13	Address bus
14	A14	Address bus
15	WE_PGM	Write Enable, control signal
16	IOREQ	Control signal
17	VCC2	Supply +5 V
18	VPP1	Programming voltage
19	MIVAL	TS input
20	MICLK	TS clock input
21	A12	Address bus
22	A7	Address bus
23	A6	Address bus
24	A5	Address bus
25	A4	Address bus
26	A3	Address bus
27	A2	Address bus
28	A1	Address bus
29	A0	Address bus
30	D0	Data bus
31	D1	Data bus
32	D2	Data bus
33	IOIS16	Free
34	GND	Earth
35	GND	Earth

Pin	Signal	Designation
36	CD1	Card Detect, control signal
37	MD3	TS output
38	MD4	TS output
39	MD5	TS output
40	MD6	TS output
41	MD7	TS output
42	CE2	Card Enable 2, control signal
43	VS1	Free
44	IORD	IO Read, control signal
45	IOWR	IO Write, control signal
46	MSTRT	TS input
47	MDI0	TS input
48	MDI1	TS input
49	MDI2	TS input
50	MDI3	TS input
51	VCC1	Supply voltage +5 V
52	VPP2	Programming voltage 2
53	MD14	TS input
54	MD15	TS input
55	MD16	TS input
56	MD17	TS input
57	MOCLK	TS clock output
58	Reset	Control signal
59	Wait	Control signal
60	INPACK	Free
61	REG	Register Select, control signal
62	MOVAL	TS output
63	MOSTRT	TS output
64	MD0	TS output
65	MD1	TS output
66	MD2	TS output
67	CD2	Card Detect 2, control signal
68	GND	Earth

INTERFACES

TS-ASI INPUT (BNC)

TS-ASI IN

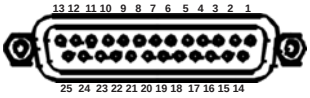
TS-ASI OUTPUT (BNC)

TS-ASI OUT

EXTERNAL REFERENCE INPUT/OUTPUT (BNC) OPTION!

REF 10 MHz IN / OUT

SYSTEM-INTERFACE (SUB-D 25-POLE)



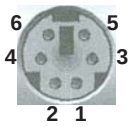
Connection	Signal	Designation
1	GND	Earth
2	U_System	connected battery voltage
3	Modul CVBS	Video input
4	Modul Grün	Green input
5	Modul Audio links	Audio input left
6	SPDIV	Digital audio output
7	Ethernet 3_TX +	Ethernet transmitter +
8	Ethernet 3_RX +	Ethernet receiver +
9	GND	Earth
10	Hyperstone_TX	Measurement processor serial interface
11	AT3_PSEN	
12	Hyperstone_IO1	Measurement processor port 1
13	Referenz 10 MHz	
14	U_System	connected battery voltage
15	Fast Blank	Trigger oscilloscope
16	Modul Rot	Red input
17	Modul Blau	Blue input
18	Modul Audio rechts	Audio input right
19	GND	Earth
20	Ethernet 3_TX -	Ethernet transmitter -
21	Ethernet 3_RX -	Ethernet receiver -
22	Hyperstone_RX	Measurement processor serial interface
23	AT_RES	
24	Hyperstone_IO2	Measurement processor port 1
25	Hyperstone_IO0	Measurement processor port 0

INTERFACES

CHARGE LEVEL DISPLAY FOR A LITHIUM ION BATTERY

Operating conditions	Signal	Note:
The unit is externally powered	Green LED	When the unit is drawing power internally from the battery the green LED does not light up
The unit is externally powered and the internal battery is being charged	Yellow LEDs and green LED	Battery charge indication: 0 LED = 0 % (flat) 1 LED = 20 % 2 LEDs = 40 % 3 LEDs = 60 % 4 LEDs = 80 % 5 LEDs = 100% (fully charged)
The unit is not being externally powered and the button is pressed	Yellow LEDs	Battery charge indication: 0 LED = 0 % (flat) 1 LED = 20 % 2 LEDs = 40 % 3 LEDs = 60 % 4 LEDs = 80 % 5 LEDs = 100% (fully charged)
Note: If the yellow LEDs do not light up after a short time despite the unit being externally powered, the externally applied voltage is too low!		
Delivery status: In the delivery status, the fuse has been removed to prevent the unit being switched on inadvertently! A T 8.0 A fuse is supplied with the unit.		

EXTERNAL KEYBOARD (PS2)



Pin	Signal
1	Data
2	not connected
3	Earth
4	+5 V
5	Clock
6	not connected

IRDA: (IR)

Serial infra-red interface

INTERFACES

RS232 INTERFACE

Pin	Signal	Designation
1	DCD	signals that carrier signal is O.K.
2	RXD	Reception data
3	TXD	Transmission data
4	DTR	Device receive ready
5	GND	Earth
6	DSR	Outstation receive ready
7	RTS	Transmission demand
8	CTS	Outstation receive ready
9	RI	Incoming call

CST 200 CARD

Pin	Signal	Designation
1	GND	Earth
2	D3	Data bus
3	D4	Data bus
4	D5	Data bus
5	D6	Data bus
6	D7	Data bus
7	PCE1	Card enable 1, control signal
8	PA10	Address bus
9	POE1	Control signal
10	PA9	Address bus
11	PA8	Address bus
12	PA7	Address bus
13	VCC	Supply voltage +3,3 V
14	PA6	Address bus
15	PA5	Address bus
16	PA4	Address bus
17	PA3	Address bus
18	PA2	Address bus
19	PA1	Address bus
20	PA0	Address bus
21	D0	Data bus
22	D1	Data bus
23	D2	Data bus
24	PIO16	Control signal
25	PCD2	Card Detect 2, control signal
26	PCD1	Card Detect 1, control signal

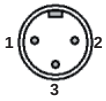
Pin	Signal	Designation
27	D11	Data bus
28	D12	Data bus
29	D13	Data bus
30	D14	Data bus
31	D15	Data bus
32	PCE2	Card Enable 2, control signal
33	NC	not assigned
34	PIORD	IO Read, control signal
35	PIOWR	IO Write, control signal
36	PWED	IO Read, control signal
37	PIRQ	Control signal
38	VCC	Supply voltage +3,3 V
39	NC	not assigned
40	NC	not assigned
41	PRES	Control signal
42	PWAIT	Control signal
43	INPACK	Control signal
44	PREG	Register Select, Control signal
45	BVD2	Battery Voltage Detect 2
46	BVD1	Battery Voltage Detect 1
47	D8	Data bus
48	D9	Data bus
49	D10	Data bus
50	GND	Earth

INTERFACES

ETHERNET INTERFACE (LAN)

Connection	Signal	Designation
1	TXP	Transmit positive
2	TXN	Transmit negative
3	RXP	Receive positive
4		not assigned
5		not assigned
6	RXN	Receive negative
7		not assigned
8		not assigned

DC SUPPLY SOCKET (XLR)



Pin	Signal	Description
1	GND	Earth (-)
2	V supply +	13.5...16 V = operation and battery charging, < 11.0 V = Disconnecting external voltage
3	wake on power	If Pin 3 is connected to Pin 2, the signal meter automatically switches on when the supply voltage is connected.

TECHNICAL APPENDIX

DESIGN

- Manageable portable signal meter
- High-resolution 10.4“ TFT colour display to graph analogue and digital TV signals and graphics
- Backlight - thus the display is excellently readable also in bright sunlight (typ. 600 cd/m^2)
- Easy operation using 12 hard keys and through the infrared touch screen for menu-dependant, user-controlled, intuitive operation (context-dependant help)
- The touch screen control panels can be adapted to the needs of left and right handers
- Alphanumeric touch screen keyboard to enter numbers and text
- Shoulder strap that can be adapted in length

FUNCTIONS

- MER measurement for all digital modulation types
- BER measurement
- Spectrum analyser with individually selectable start and stop frequencies, centre-frequency entry and span
- Simultaneous representation of channel spectrum and picture
- Memory-oscilloscope
- Constellation analyser for all DVB standards
- MPEG and analogue TV screen
- Demodulation of analogue signals: AM (CATV, rerr.), FM (satellite, radio)
- Demodulation of digital signals: DVB-C, DVB-T, DVB-S (DVB-S2 projected)
- Demodulation of the digital USA standard s (J83B, DOCSIS, ATSC)
- Possibility to measure the video amplitude with line selection, S/N weighting and hum measurement
- S/N weighting: typ. 57 dB
- Channel selection in DVB-C, DVB-S, DVB-T and analogue through frequency entry, channel entry and user lists
- Remote control through Ethernet and modem
- Data logging and automatic measurements (in preparation)
- Automatic measurements for CTB and CSO (in preparation)
- Return path measurements (in preparation)
- The result of the memory oscilloscope and the numerical value are shown in large format
- Measurement units dBµV, dBm (dBmV, µV and mV in preparation)
- DiSEqC™ screen
- Multimeter for LNB supply
- Insert positions to extend the meter in its functions (e.g. DVB-S2)
- For mains and battery operation
- Rechargeable 6.5 Ah Li-Ion battery, thus suitable for mobile use
- Remote control software (in preparation)

TECHNICAL APPENDIX

Type	CE	MSK 200	MSK 200/50
Order no.		21710015	21710018
Spectrum analyser			
Frequency range	MHz	5-3100	
Resolution bandwidth (-3 dB)	MHz	0.001-10	
Resolution bandwidth (-6 dB)	kHz	9, 25, 50, 120, 200	
Video bandwidths	MHz	0.00001-3	
Phase noise at 10 kHz carrier level spacing	dBc	<-90 (1 Hz), typ. -95 (1 Hz)	
Phase noise at 100 kHz carrier level spacing	dBc	<-100 (1 dB), typ. -110 (1 Hz)	
Dynamic (RBW: 100 kHz)	dB	Typ. 70	
Level measurement range	dBµV	20-130	
Accuracy of measurements	dB	< 1.5	
Measurement detector	dB	Max peak, min peak, auto peak, sample, RMS	
Return loss (pre-attenuation 5 dB)	dB	> 16 (VSWR: 1.35)	
Repetition speed	Picture/s	Max. 10	
Reference level	dBµV	30-130	
Range of indication	dB	100, 70, 50, 30, 20, 10	
Screen resolution	Pixel	Max. 800 x 600/nominal 501 x 401	
Analogue TV receiver			
Standards		B/G, I, D/K, L/L´, M/N	
Colour standards		PAL, SECAM, NTSC	
Sound standards		IRT-A2, NICAM, BTSC, EIA-J	
Frequency increment	kHz	50	
Video IF bandwidth		Standard-dependent	
Audio IF bandwidth		Standard-dependent	
Video output voltage/impedance	V_{ss}/Ω	1/75 ± 1 dB	
Hum measurement	dB	> 50	
S/N weighting (to CCIR Rec. 567)	dB	> 55/typ. 57	
Analogue satellite receiver			
Standard		FM to CCIR Rec. 405	
Colour standards		PAL, SECAM, NTSC	
Sound standards	µs	De-emphasis: 50/Panda-Wegener: 75	
Frequency increment	kHz	200	
Video IF bandwidth	MHz	27/36	
Audio IF bandwidth	kHz	130/380	
Video output voltage/impedance	V_{ss}/Ω	1/75 ± 3 dB	
Hum measurement	dB	> 50	
S/N weighting (to CCIR Rec. 567)	dB	> 55/typ. 60	
Analogue input			
S/N weighting (to CCIR Rec. 567)	dB	Typ. up to 80	

TECHNICAL APPENDIX

Digital CATV receiver (J83 A, B, C)		
Modulation type		16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
Symbol frequency	MSymb/s	2.0-6.999
Frequency increment	kHz	50
Video output voltage/impedance	V_{ss}/Ω	1/75 ± 1 dB
IF bandwidths	MHz	1, 5, 6, 7, 8, 12
MER measurement	dB	> 33/typ. 38
Digital terrestrial TV receiver (DVB-T, ATSC)		
Modulation type		QPSK, 16 QAM, 64 QAM, 8 VSB
Symbol frequency		Standard-dependent
Frequency increment	kHz	50
Video output voltage/impedance	V_{ss}/Ω	1/75 ±1 dB
IF bandwidths	MHz	1,5, 6, 7, 8, 12
MER measurement	dB	> 35
Digital satellite receiver (DVB-S)		
Modulation type		QPSK
Symbol frequency	MSymb/s	2-45.0
Frequency increment	kHz	200
IF bandwidths	MHz	8, 18, 27, 36, 54
Video output voltage/impedance	V_{ss}/Ω	1/75 ± 1 dB
MER measurement	dB	>1 4
Constellation analysis		
DVB-C		16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
DVB-T		QPSK, 16 QAM, 64 QAM
DVB-S		QPSK
ATSC		8 VSB
Memory oscilloscope		
Resolution	Bit	12
Sampling rate	MHz	54
Memory depth	Picture	1
Remote Feeding		
Switching voltage/max. current	V/mA	5-20/600
Control signals	kHz	22, Tone Burst, DiSEqC™ 2.0, SCR single-cable system and UFO®*micro* control signals
Power supply		
Mains (power supply unit)	V/Hz/W	100-250/50-400/100
Rechargeable Li-Ion battery	V/Ah	11,1/6.45
DC external	V	10.8-14.0

TECHNICAL APPENDIX

Connections			
RF input standarad (impedance)	Ω	1.6/5.6 (75)	N-type socket (50)
Composite colour picture input/output, RGB output		Scart socket	
Video input/output		2 x BNC socket	
Transport current input/output		2 x Sub D socket (25-pole)	
ASI input/output		2 x BNC socket	
Common interface/card reader		1/1	
PCMCIA slot		1	
Interconnection		1 x Ethernet	
USB port		2	
External keyboard		PS-2	
External mouse		USB	
Headphone connection	mm	Phone jack 3.5	
Modem interface		RS 232/Mini DIN, 9-pole (socket)	
DC supply 12 V		XLR socket	
General			
Screen		10.4“, TFT, 800 x 600 pixels with backlight	
Touch Screen		Infra-red	
Temperature range	°C	+5 to +45	
Dimensions (W x H x D)	mm	374 x 294 x 124	
Weight	kg	Approx. 8	

MSK 200/50 with 50-Ohms N-type socket

SERVICE

Device maintenance is essentially limited to cleaning the exterior.

DEVICE CALIBRATION

The calibration interval is dependent on operational demands made on it and should be carried out every 1 to 2 years. The calibration can be carried out by ESC Kathrein customer service, see below.

EXTERIOR CLEANING

Clean the exterior of the device using a soft cloth, fluff-free duster or a brush. In case of heavier soiling it is also possible to use alcohol or a mild soap solution. Under no circumstances is it allowed to use solvents such as thinners, acetone, etc., as otherwise plastic parts and markings may be damaged.

INTERIOR CLEANING

Caution!

As it is necessary to open the device to clean the interior, this work is only allowed to be undertaken by authorised service personnel! The device should be freed of dust deposits inside the device every 1 to 2 years to ensure correct ventilation. The cleaning interval is based on the length of time the device is operated each day and the amount of dust in the premises. It is necessary to remove the back panel or the control panel for cleaning. Dust deposits can be removed using a brush or grease-free compressed air.

FUNCTION TEST

It is recommendable to check the nominal data at appropriate intervals. The data and tolerances are given in the technical data.

MEASURING EQUIPMENT REQUIRED

- TV/SAT signal generator to check the level accuracy as well the analogue measurements and demodulation.
- DVB signal generator to check the level accuracy and digital measurements and demodulation.

STORAGE

The storage temperature range for the device is -40 ... +70°C.
During storage the device is to be protected against dust and moisture.

SERVICE

MAIN SERVICES

www.esc-Kathrein.de
Fa. ESC Elektronik Service Chiemgau GmbH
Bahnhofstr. 108
83224 Grassau
E-Mail: service@esc-kathrein.de

SERVICE

If, despite studying this operating manual, you still have questions about getting started with the unit or using it correctly, or if unexpected problems occur, please contact your specialist dealer.

936.3247/A/1207/ZWT - Technical data subject to change!

Internet: http://www.kathrein.de
KATHREIN-Werke KG • Anton-Kathrein-Straße 1 - 3
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KATHREIN
Antennen · Electronic